

Application No. 09/520,004  
Amendment dated September 19, 2008  
After Final Office Action of March 19, 2008

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### REMARKS

Applicants submit this response concurrently with their Request for Continued Examination filed herewith. Claims 2-21 are pending in the instant application. Claim 1 stands canceled. No claim amendments are presented. No new matter is introduced.

#### Rejection under 35 U.S.C. § 103(a)

Claims 2-6, 8-11, 14-15, and 20-21 are rejected as being unpatentable over Todd et al. (US 5,082,975). It is alleged that Todd discloses the synthesis of hexahydrolupulone and its use as a selective inhibitor of cell growth. Specifically, it is alleged that the pH of the aqueous hop acid solution or the pH of the process medium is not provided in Todd, but that the process medium of Todd would inherently have a high pH due to the hydroxide ions. It is further alleged that it would have been obvious to use the teachings of Todd to inhibit the growth of unwanted cells except for yeast. Applicants disagree and respectfully traverse.

As an initial matter, Applicants would like to address various statements made in the Action. On page 4, the Action states that "the fact that the treatment of a solution inoculated with yeast with a stable alkaline solution of hexahydrolupulone did not inhibit fermentation." Applicants disagree.

Todd relates to synthetic methodology for making hexahydrolupulone compounds. Aqueous alkaline solutions of hop acids are provided in Example 1 of Todd, wherein the aqueous alkaline solution is utilized to remove catalyst poisons in the synthesis of a specific hop acid form. Example 1 does NOT provide for an aqueous alkaline solution of hop acid used to inhibit bacterial growth. Examples 2-4 relate to methods of hydrogenation and hop acids. Examples 2-4 do NOT provide for an aqueous alkaline solution of hop acid used to inhibit bacterial growth. Example 5 provides an aqueous alkaline solution of hexahydrolupulone, which results from an extractive work-up procedure to remove catalyst poisons after hydrogenation. Example 5 does NOT provide for an aqueous alkaline solution of hop acid used to inhibit bacterial growth. Example 6 provides for the use of hexahydrolupulone to inhibit bacterial growth using hexahydrolupulone dissolved in water and glycerine. Example 6 does NOT provide for an aqueous alkaline solution of hop acid used to inhibit bacterial growth.

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The Action at page 4 also states that "Todd Jr. discloses that addition of stable alkaline solution of hexahydrolupulone did not inhibit the fermentation, and therefore the alkaline solution is expected to be added prior to fermentation." Applicants disagree.

The only aqueous alkaline solutions of hop acids presented by Todd are made for the purpose of purifying and/or extracting hop acids after a hydrogenation reaction. As noted previously in Examples 1 and 5 of Todd, the aqueous alkaline solutions of beta acids and hexahydrolupulone are formed after a hydrogenation reaction so that catalyst poisons can be removed. The only exemplification of the use of hop acids to inhibit bacteria is found in Example 6, which does not use an aqueous alkaline solution of hop acids, and which solution is not used prior to fermentation.

Additionally, it is alleged that "[a]ddition of hops/hop extracts to the wort during various stages of beer production was well known in the art." Applicants disagree and submit that no support is provided in the action for such an assertion. Applicants contend that those of ordinary skill in the art in the beer brewing industry typically introduce hops to a process medium (e.g., kettle) which after boiling is added to yeast. In contrast, the instant claims recite combining the aqueous alkaline hop acid solution with the yeast pre-fermentation and introduce the yeast-alkaline hop acid mixture into an aqueous process medium. Thus, Applicants disagree that those of ordinary skill in the art in the beer brewing industry would add an aqueous alkaline solution of hop acids to yeast prior to fermentation.

The Action appears to draw conclusions relating to the instant invention from two separate processes. The aqueous alkaline hop acid solution formed in Todd is utilized to remove catalyst poisons in a purification/extraction step. A hop acid solution (not alkaline) is then used to inhibit bacteria. However, Todd does not teach or suggest that an aqueous alkaline hop acid solution can be used to inhibit bacteria growth, and that such a solution is used prior to fermentation.

In contrast, claim 2 of the instant invention is directed towards methods of inhibiting bacterial growth in an aqueous process medium comprising adding a hop acid, characterized in, that the process comprises: (a) dissolving the hop acid in an aqueous alkaline medium to form an aqueous alkaline hop acid solution; (b) combining the aqueous alkaline hop acid solution with yeast to form a yeast/aqueous alkaline hop acid mixture, and introducing the yeast/aqueous

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alkaline hop acid mixture into an aqueous process medium; and (c) continuously adding an effective amount of the aqueous alkaline hop acid solution, pre fermentation, to the aqueous process medium, wherein the pH of the aqueous alkaline hop acid solution is higher than the pH of the aqueous process. Clearly, the invention uses an aqueous alkaline hop acid prior to the fermentation process.

Additionally, the Todd examples do not show treatment of any media with alkaline hop acid solutions. Todd also does not disclose treatment pre-fermentation of the yeast growing tank, fermentation tank, fermentable feed or the yeast itself, which is an aspect of the instantly claimed technology.

Applicants submit herewith a declaration under 37 CFR 1.132 by Mr. Chris Most, Production Manager at Nebraska Energy LLC. Mr. Most supervised or conducted experiments to examine the effect of hop acids in fuel ethanol production. Mr. Most indicates that it is his expert opinion that one of ordinary skill in this field would not have expected the use of hops acids in the manner described in Applicants' application to have any appreciable effects on fuel ethanol production. Mr. Most also indicated that the addition of hop acids, administered pre-fermentation during the production of fuel ethanol in processes conducted by him or under his supervision, provided numerous surprising and unexpected benefits in the fuel ethanol production process (see, e.g., Paragraph 8, Most Declaration). Specifically, the Most Declaration states that the addition of hop acids resulted in higher alcohol numbers, increased throughput capacity, and increased "backset," which is described as particularly useful in decreasing cost and starting materials.

To establish a *prima facie* case of obviousness, three criteria need be met: (i) there must be a suggestion or motivation to modify the reference or combine the teachings; (ii) there must be a reasonable expectation of success; and (iii) the prior art reference must teach or suggest all the claim limitations. See, MPEP 2143. Applicants submit that Todd does not provide any motivation, reasonable expectation of success, or provide a disclosure of all of the Applicants' claim limitations; and furthermore Todd does not provide any insight into the surprising and unexpected results observed by Mr. Most. As such, Applicants submit that the *prima facie* case is overcome and respectfully request withdrawal of the rejection.

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Claims 7 and 16-19 are rejected as being unpatentable over Todd et al. (US 5,082,975) in view of Simpson, W. J. (J. Inst. Brew., 1987, 93, pp. 405-406). It is alleged that Todd, as described *supra*, discloses the synthesis of hexahydrolupulone and its use as a selective inhibitor of cell growth, but does not disclose isomerized hop acids. It is further alleged that Simpson discloses alkaline aqueous solutions of isomerized hop acids, and that it would have been obvious to modify the disclosure of Todd to include the Simpson alkaline aqueous solutions of isomerized hop acids. Applicants disagree and respectfully traverse.

As discussed above, the Todd examples do not show treatment of any media with alkaline hop acid solutions. Todd also does not disclose treatment pre-fermentation of the yeast growing tank, fermentation tank, fermentable feed or the yeast itself, which is an aspect of the instantly claimed technology. Simpson relates to a study of acid washing of pitching yeast slurries. Thus, Simpson relates to used yeast (that is, post fermentation), which is different and distinguishable from Applicants' pre-fermentation technology. As such, Simpson fails to disclose treatment pre-fermentation of the growing tank, fermentation tank, fermentable feed or the yeast itself, which is an aspect of the instantly claimed technology. Furthermore, Todd et al. and Simpson do not provide any insight into the surprising and unexpected results seen by Mr. Most as detailed above. As such, Applicants submit that the *prima facie* case is overcome and respectfully request withdrawal of the rejection.

Claims 12 and 13 are rejected as being unpatentable over Todd et al. (US 5,082,975) in view of Simpson, W. J. (J. Inst. Brew., 1987, 93, pp. 405-406), and further in view of Todd et al. (US 4,002,683). It is alleged that Todd ('975) and Simpson, as described *supra*, disclose the methods of the instant invention, and that Todd ('683) further discloses a process for isomerizing alpha acids to iso-alpha acids. It is further alleged that it would have been obvious to modify the teachings of Todd ('975), Simpson, and Todd ('683) to arrive at an aqueous alkaline iso-alpha hop acid solution as described by Todd ('683). Applicants disagree and respectfully traverse.

As discussed above, the Todd ('975) examples do not show treatment of any media with alkaline hop acid solutions. Simpson relates to used yeast (that is, post fermentation), which is different and distinguishable from Applicants' pre-fermentation technology. Todd ('683) also does not disclose treatment pre-fermentation of the yeast growing tank, fermentation tank, fermentable feed or the yeast itself, which is an aspect of the instantly claimed technology. As

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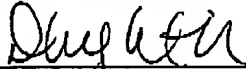
such, Todd ('975), Simpson and Todd ('683) fail to disclose treatment pre-fermentation of the growing tank, fermentation tank, fermentable feed or the yeast itself, which is an aspect of the instantly claimed technology. Furthermore, Todd ('975), Simpson and Todd ('683) do not provide any insight into the surprising and unexpected results seen by Mr. Most as detailed above. As such, Applicants submit that the *prima facie* case is overcome and respectfully request withdrawal of the rejection.

In view of the above remarks, Applicants believe the pending application is in condition for allowance. Should any of the claims not be found to be allowable, the Examiner is requested to telephone Applicants' undersigned representative at the number below. Applicants thank the Examiner in advance for this courtesy.

The Director is hereby authorized to charge or credit any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 04-1105, under Order No. 51035-61755.

Dated: September 19, 2008

Respectfully submitted,

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